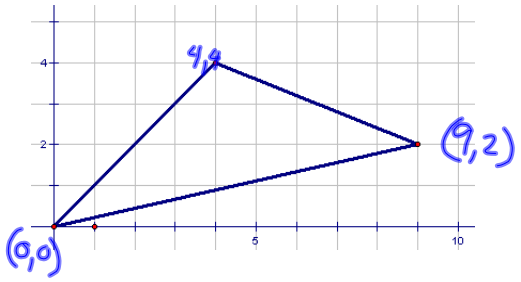
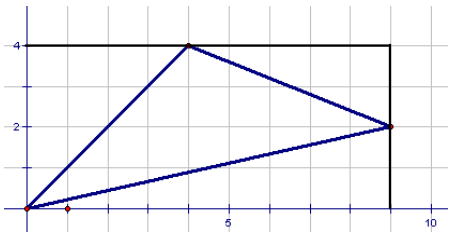
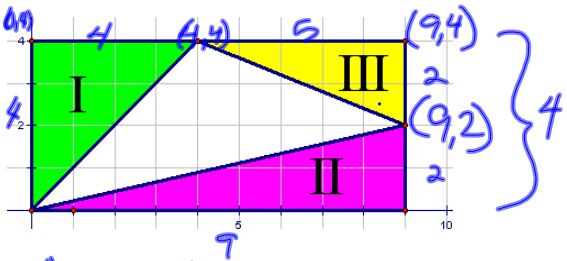
Area by Determinants 4.5 (cont.)



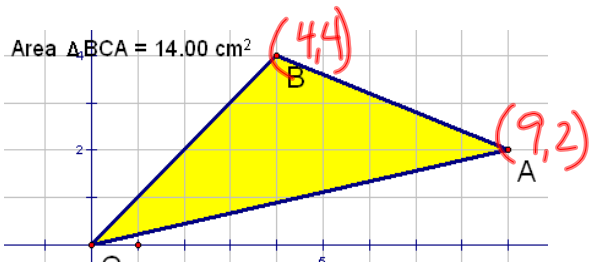




$A_{Rect} - A_I - A_{II} - A_{III}$

$9 \cdot 4 - \frac{1}{2}44 - \frac{1}{2}9 \cdot 2 - \frac{1}{2}2 \cdot 5$

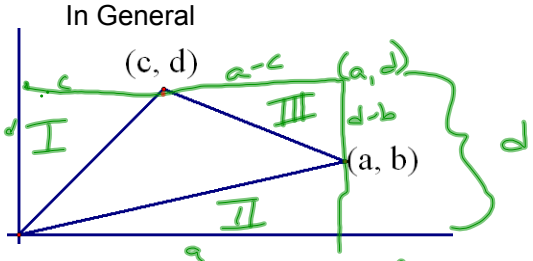
$36 - 8 - 9 - 5$ $A = 14_{units^2}$



$A = \frac{1}{2}\begin{vmatrix} 9 & 2 \\ 4 & 4 \end{vmatrix} = 14_{u^2}$

$36 - 8$

In General



$A_{rect} - A_I - A_{II} - A_{III}$

$a \cdot d - \frac{1}{2}cd - \frac{1}{2}ab - \frac{1}{2}(a-c)(d-b)$

$ad - \frac{1}{2}cd - \frac{1}{2}ab - \frac{1}{2}ad + \frac{1}{2}ab$

$\frac{1}{2}ad - \frac{1}{2}bc$

$+ \frac{1}{2}cd - \frac{1}{2}bc$

$= \frac{1}{2}ad - \frac{1}{2}bc$

$= \frac{1}{2}(ad - bc)$

$\begin{vmatrix} a & b \\ c & d \end{vmatrix} = ad - bc$

Example:
Find the area
(0, 0), (5, 2) (4, 6)

Area of $\triangle$ w/ coord.
(0,0)
(a,b)
(c,d)

$= \frac{1}{2}\begin{vmatrix} a & b \\ c & d \end{vmatrix}$

$= \frac{1}{2}\begin{vmatrix} 5 & 2 \\ 4 & 6 \end{vmatrix}$

$30 - 8$

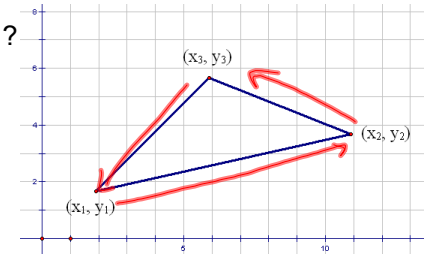
$A = 11u^2$

Do:
Find the area.
(0, 0), (5, -3) (-10, 9)

$A = \frac{1}{2}\begin{vmatrix} 5 & -3 \\ -10 & 9 \end{vmatrix}$

$45 - 30$ is $= 7.5u^2$

What if...?



$$A = \frac{1}{2}\left[\begin{vmatrix} x_1 & y_1 \\ x_2 & y_2 \end{vmatrix} + \begin{vmatrix} x_2 & y_2 \\ x_3 & y_3 \end{vmatrix} + \begin{vmatrix} x_3 & y_3 \\ x_1 & y_1 \end{vmatrix}\right]$$

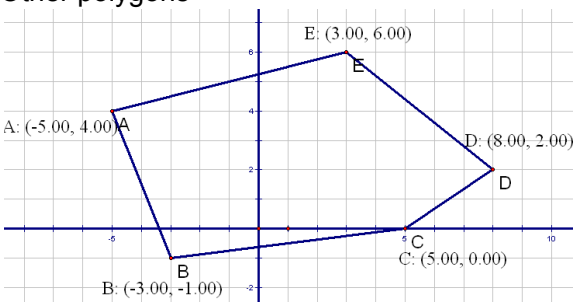
Ex:
Find the area:
(3, 8) (5, 1) (-1,2)

$$A = \frac{1}{2}\left[\begin{vmatrix} 3 & 8 \\ 5 & 1 \end{vmatrix} + \begin{vmatrix} 5 & 1 \\ -1 & 2 \end{vmatrix} + \begin{vmatrix} -1 & 2 \\ 3 & 8 \end{vmatrix}\right]$$

$-37 \quad 11 \quad -14$

$A = 20u^2 \quad -40$

Other polygons



$$A = \frac{1}{2}\left[\begin{vmatrix} -5 & 4 \\ -3 & -1 \end{vmatrix} + \begin{vmatrix} -3 & -1 \\ 5 & 0 \end{vmatrix} + \begin{vmatrix} 5 & 0 \\ 8 & 2 \end{vmatrix} + \begin{vmatrix} 8 & 2 \\ 3 & 6 \end{vmatrix} + \begin{vmatrix} 3 & 6 \\ -5 & 4 \end{vmatrix}\right]$$

$17 \quad 5 \quad 10 \quad 42 \quad 42$

$A = \frac{1}{2}116$

$A = 58u^2$

p. 187 #s 41, 43, 44, 49

p187

41, 43, 44, 49

$1u = 10mi$

$1u^2 = 100mi^2$